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(54) Title: PERSONAL CARE FOAM COMPOSITIONS (57) Abstract The present invention relates to compositions dispensable as foams comprising a water soluble, non-polymeric mineral salt, a select surfactant system, a thickener, and water which upon dispensing provides voluminous and stable foam.		

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PERSONAL CARE FOAM COMPOSITIONS

TECHNICAL FIELD

The present invention relates to compositions dispensable as foams
10 comprising a water soluble, non-polymeric mineral salt, a select surfactant system, a thickener, and water which upon dispensing provides voluminous and stable foam.

BACKGROUND OF THE INVENTION

Cosmetic compositions such as shaving creams, hair mousses, spray foams,
15 foaming lotions and foaming creams are intended to be dispensed or sprayed as foams and applied onto the human skin or hair. These products are described in the present invention as "leave-on foaming cosmetic products". One common characteristic desired for these leave-on foaming cosmetic products is a foam having favorable characteristics to the consumer such as voluminous and stable foaming,
20 with smooth and mild touch to the skin and hair.

Leave-on foaming cosmetic compositions for hair are usually referred to as "mousses", which term will be used in the present invention. Hair mousses were born in Europe in the early 1980s. Hair mousses are fundamentally an aerosol foam, however, non-aerosol foams are also known. The general appeal of hair mousses
25 can be largely attributed to the ease of application and controlled amount of product which are possible from mousse formulations. Hair mousse compositions are generally dispensed by a compressible dispenser or a valve and applied to the user's hand or a specifically designed comb and spread through the hair. Alternatively, hair mousse compositions can be directly applied to the hair by dispensing through
30 nozzles. Hair mousses are formulated for the purpose of styling, setting, and arranging, or for other purposes such as shampooing, conditioning, treating, dyeing, and combinations thereof.

Performance evaluation with respect to foam compositions vary depending on the purpose and concept of the foam product. For example, in evaluating the
35 performance of a hair mousse, one generally considers properties seen in three major stages; the properties of the foam upon dispensing from the package, the properties of the foam upon applying to the hair, and properties of the end results to the hair. Properties considered upon dispensing include volume of foam and foam expansion speed. It is known that when foam expansion is slow or delayed, "pooling" of the product occurs. Properties considered upon applying to the hair include stability and
40 breakability of the foam, non-soapiness, smoothness, softness, creaminess, and

5 stickiness. Properties considered on the end results to the hair include style control, dry or wet feel of hair, removability, shine, moisturizing, conditioning, anti-static, and brushing.

Typically, such foam products contain relatively large amounts of a surface active agent or surfactant (greater than 0.5%) or at lower levels in combination with
10 some polymeric material (e.g., resin). In the presence of high levels of electrolytes or salts, the electrolytes (or salts) can form complexes with surfactants which decrease the overall solubility of the surfactant and reduce the surface activity of the surfactant. In products containing relatively large amounts surfactants, these compositions can leave the hair or skin feeling coated, greasy or sticky when left on
15 the hair, especially in high humidity environments. Furthermore, the use of polymeric or resin materials tend to leave sticky films.

Therefore, a need exists for improved foam compositions which reduce the stickiness and greasiness and leave skin feeling smooth. The present inventor(s) has found that combinations of water soluble, non-polymeric mineral salts with small
20 amounts of a select surfactant system, less than about 0.5%, provide improved personal care foam compositions with decreased polymer or surfactant build-up.

It is, therefore, an object of the present invention to provide personal care compositions which foam upon being dispensed or sprayed, which provide voluminous and stable foaming, smooth and mild touch and provide reduced pooling
25 upon dispensing..

Another object of the present invention is to provide personal care compositions containing less than about 0.5% surfactant(s) and water soluble, non-polymeric mineral salts which foam upon being dispensed or sprayed and provide good hair or skin conditioning with decreased polymer build-up on the hair and skin.

30 It is also an object of the present invention to provide personal care mousses, depilatories or shaving creams which contain less than about 0.5% surfactant(s) and water soluble, non-polymeric mineral salts which produce stable foams upon being dispensed or sprayed wherein the foams have appropriate foam breakdown under shear and are easy to spread on hair.

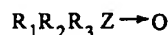
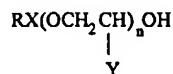
35 It is also an object of the present invention to provide a hair cleaning foam composition containing less than about 0.5% surfactant(s) and water soluble, non-polymeric mineral salts wherein the foam is produced upon spraying or dispensing the composition to give the visual perception of clean hair.

These and other objects will become readily apparent from the detailed
40 description which follows.

SUMMARY OF THE INVENTION

5 The compositions of the present invention relate to personal care compositions dispensable as a stable foam, comprising:

- a.) from about 0.5% to about 5% by weight of the composition of a friction enhancing agent which is a water soluble, non-polymeric mineral salt;
- 10 b.) from about 0.01% to about 0.5% of a surfactant system comprising:
- i.) at least about 0.003% of at least one anionic surfactant;
- 15 ii.) at least about 0.003% of at least one amphoteric surfactant; and
- iii.) at least about 0.003% of at least one nonionic surfactant having a formula selected from the group consisting of:



20 and mixtures thereof where R is a long chain alkyl group or mixer of alkyl groups containing 10-24 carbon atoms; X is a phenyl, >C=O , sulfur or nil; Y is a hydrogen or methyl; and n is an integer from 1 to 20, preferably from 2 to 15, and most preferably from 2 to 10; when X is nil, R is bonded directly to $\text{-(OCH}_2\text{CH)}_n\text{-}$ and wherein R₁ contains an alkyl, alkenyl or monohydroxy alkyl radical of from about 8 to about 18 carbon atoms, from 0 to about 10 ethylene oxide moieties, and from 0 to about 1 glyceryl moiety, and R₂ and R₃ contain from about 1 to about 3 carbon atoms and from 0 to about 1 hydroxy group; and Z is a nitrogen, phosphorus or sulfur bonded directly to O;

25

30

35

and

c.) water

wherein the composition contains less than about 0.2% by weight of the composition of a protein modifying agent and wherein the composition contains less than 0.01% formate, sorbate, salicylate and carbonate.

40

5 The present invention further relates to methods of using the personal care compositions.

DETAILED DESCRIPTION OF THE INVENTION

 The personal care compositions of the present invention can comprise, consist of, or consist essentially of the essential elements and limitations of the invention described herein, as well any of the additional or optional ingredients,
10 components, or limitations described herein.

 All percentages, parts and ratios are based upon the total weight of the personal cleansing compositions of the present invention, unless otherwise specified. All such weights as they pertain to listed ingredients are based on the active level and,
15 therefore, do not include carriers or by-products that may be included in commercially available materials, unless otherwise specified.

 The term "foam", as used herein, means a structure of a dispersion of gas or air in liquid forming colloidal to macroscopic gas globules which lowers the density and expands the volume occupied by the liquid.

20 By the phrase "dispensable as a stable foam," as used herein means the composition produces a foam when dispensed from a package or container which is either: 1.) pressurized; or 2.) equipped with an air or gas mixing device such as the F2 non-aerosol foamer described in U.S. Patents 5,271,530; 5,337,929; and 5,443,569; all of which are herein incorporated by reference.

25 The phrase "stable foam," as used herein, means a foam which on standing for 60 seconds at ambient temperature produces less than about 30% foam liquid drainage, preferably less than about 25% foam liquid and most preferably less than about 20% foam liquid drainage as defined by the Miles, Schedlousky and Ross Test described in J. Phys. Chem, 49, 93 (1945) and herein incorporated by reference.

30 The compositions of the present invention preferably contain less than 0.2% of an insoluble, inorganic salt complex. The term "insoluble inorganic salt complexes", as used herein, wherein the solubility of the inorganic salt complex is less than 0.5% in water at ambient temperature and pressure (25°C, 1 atmosphere pressure) includes but is not limited to, clays, bentonite, ceramic, kaolin, slip clays,
35 polyorganosilicates, kaolinite, montmorillonite, atapulgite, illite, bentonite, halloysite, silica, alumina, mudds and polyphosphates.

 The phrase "leave-on", as used herein, means compositions which are intended to be applied to hair, wet or dry and left on the hair during subsequent drying or styling. The compositions of the present invention are preferably leave-on
40 compositions.

5 The compositions of the present invention contain less than about 0.2% of a chemical protein modifying agent, preferably less than about 0.15%, more preferably less than about 0.1%. The phrase "chemical protein modifying agent," as used herein means any chemical agent known to alter the chemical bond structure of the hair's protein in such a way as to lead to oxidative or reductive changes to bond links
10 within the hair. Examples of, but not limited to, chemical protein modifying agents include ammonium thioglycolate, dithiothreitol, 1,3-dithiopropanol, glycerylmonothioglycolate, permanganate, peracetic acid, hydrogen peroxide, sodium thiosulfate, potassium sulfite, sodium bisulfite, sodium persulfate, and sodium hydroxide.

15 As used herein, the term "water soluble" refers to any material that is sufficiently soluble in water to form a substantially clear solution to the naked eye at a concentrations of 0.5% or more by weight of the material in the water at 25°C. Conversely, the term "water insoluble" refers to all materials that are not sufficiently soluble in water to form a substantially clear solution to the naked eye at a
20 concentration of about 1.0% or more by weight of the insoluble material in water at 25°C.

 The compositions of the present invention preferably contain less than 0.2% of a polymer having a solubility parameter of between about 8.5 to about 12.0 (cal/cm³)^{1/2}. The solubility parameter is defined in the Polymer Handbook 3rd ed.
25 (John Wiley and Sons, New York), J. Brandrup and E. H. Immergut, Chapter VII, pp. 519-559 as the square root of the cohesive energy density and describes the attractive strength between molecules of the material. Solubility parameters may be determined by direct measurement, correlations with other physical properties, or indirect calculation. The solubility parameters of polymers can be determined by
30 indirect calculations of group contributions as described in section 2.3 on p. 524-526 of the cited reference.

 The personal care compositions of the present invention, including the essential and optional components thereof, are described in detail hereinafter.

Essential Components

35 Water Soluble, Non-Polymeric Mineral Salt

 An essential component of the personal care compositions of the present invention is a friction enhancing agent which is a water soluble, non-polymeric mineral salt. By the term "non-polymeric", as used herein means the mineral salts of the present invention comprise no molecules comprising non repeating moieties
40 units (monomers). Without being limited by theory, it is believed that when the water soluble, non-polymeric mineral salt is solubilized and the resultant solution

5 applied to (and dried on) the hair, the water soluble salt begins to precipitate onto the surface of the dry hair, increasing the hair's overall surface friction, thus improving styling volume and fullness. Suitable water soluble, non-polymeric mineral salts include naturally occurring or synthetically derived, anhydrous and hydrate forms of mono-, di- and trivalent inorganic salts as well as organic salts. Surfactant salts and
10 salt polymers themselves are not included in the present electrolyte definition but other salts are. Suitable anionic salt substituents include, but are not limited to, halides, carbonates, phosphates, sulfates, nitrates, citrates, malates, gluconates, lactates, maleates, succinates acetates, benzoates, fumerates and the like. The counter ions of such anionic substituents are metal ions and can be, but are not
15 limited to, magnesium, calcium, sodium, potassium, or other mono- and di- -valent cations. Electrolytes most preferred for use in the compositions of the present invention include sodium, potassium and magnesium sulfates; sodium and potassium hydrogen carbonates or hydrogen sulfates; sodium and potassium carbonates; sodium, potassium, magnesium and calcium primary phosphates as well
20 as sodium and potassium secondary phosphates. It is recognized that these salts may serve as thickening aids or buffering aids in addition to their role in increasing hair friction. The water soluble, non-polymeric mineral salt is preferably present at concentration levels of from about 0.5% to about 5%, more preferably from about 0.7% to about 4%, most preferably from about 1% to 3%.

25 Surfactant System

The personal care compositions of the present invention also comprise as an essential component a surfactant system comprising an anionic surfactant, a amphoteric surfactant, and a polyoxyethylene alcohol. Preferably the surfactants of the surfactant system are water soluble surfactants. By "water-soluble surfactant" is
30 meant surfactant materials which form clear solutions when dissolved in water at 0.2 weight percent at ambient conditions. For the purposes of the present invention, the term "clear" is intended to mean that the solution formed is substantially transparent to visible light although a slight amount of haze may be present as long as one can see through the composition. The surfactant system is preferably present at a
35 concentration of up to about 0.5%, more preferably up to about 0.3%, most preferably up to about 0.2%. Additionally, the surfactant system of the present invention are preferably present in a ratio of mineral salt to surfactant system of from about 2:1 to about 50:1, more preferably from about 2:1 to about 20:1, most preferably from about 5:1 to about 15:1.

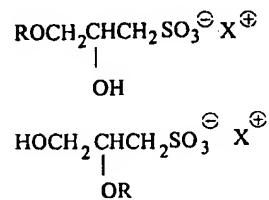
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Anionic Surfactants

An essential component of the surfactant system of the present invention is at least one anionic surfactant. Suitable anionic surfactants are described in U.S. Patent 4,472,297 (Bolich Jr. et. al.) and further described in "Surfactant Science Series: Anionic Surfactants", Volume 7, edited by Warner M. Linfield, Marcel Dekker, New York (1976), herein incorporated by reference in its entirety. Examples of suitable anionic surfactants include, but are not limited to, sodium lauryl sarcosinate, sodium lauryl sulfate, ammonium lauryl sulfate, sodium laureth sulfate, ammonium laureth sulfate, and disodium lauryl sulfosuccinate and mixtures thereof.

A preferred class of anionic surfactants includes alkyl glyceryl ether sulfonate surfactants (also referred to herein as an "AGS" surfactant), derivatives thereof and salts thereof. These AGS surfactants are derived from an alkyl glyceryl ether containing a sulfonate or sulfonate salt group. These compounds generally can be described as an alkyl monoether of glycerol that also contains a sulfonate group.

These AGS surfactants can be described as generally conforming to the following structures:



wherein R is a saturated or unsaturated straight chain, branched chain, or cyclic alkyl group having from about 10 to about 18 carbon atoms, preferably from about 11 to about 16 carbon atoms, and most preferably from about 12 to about 14 carbon atoms, and X is a cation selected from the group consisting of ammonium; mono-alkylsubstituted ammonium; di-alkylsubstituted ammonium; tri-alkylsubstituted ammonium; tetra-alkylsubstituted ammonium; alkali metal; alkaline metal; and mixtures thereof. More preferably, the alkyl radicals, R in the above formulas, are saturated and straight chain.

The AGS surfactants useful in the present invention are more fully described in U.S. Patent No. 2,979,465, to Parran et. al., issued April 11, 1961; U.S. Patent No. 3,179,599, to Eaton et. al., issued April 20, 1965; British Patent No. 848,224, published Sept. 14, 1960; British Patent No. 791,415, published March 5, 1958; U.S. Patent No. 5,322,643, to Schwartz et. al., issued June 21, 1994; and U.S. Patent No. 5,084,212, to Farris et. al. issued Jan. 28, 1992; which are all hereby incorporated herein by reference in their entirety. These references also disclose various cleansing products in which the AGS surfactant of this invention can be used.

5 Mixtures of any of the above described anionic surfactants can be used in the composition of the present invention.

The anionic surfactant of the surfactant system is present in the compositions of the present invention at concentrations of at least about 0.003%, preferably at least about 0.0075% and most preferably at least about 0.01% by weight of the composition.

Amphoteric Surfactants

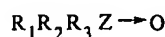
Another essential component of the surfactant system of the present invention are amphoteric surfactants. Examples of amphoteric surfactants suitable for use in the compositions are described in U.S. Patent 4,472,297 (previously incorporated by reference); U.S. Patent 5,104,646 (Bolich Jr. et. al.); and U.S. Patent 5,106,609 (Bolich Jr. et. al.) and can be further described in "Surfactant Science Series: Amphoteric Surfactants", Volume 12, edited by Bernard R. Bluestein, Clifford L. Hilton, Marcel Dekker, New York (1982) all of which are herein incorporated by reference in their entirety. Mixtures of the above described amphoteric surfactants can be used. Preferred amphoteric surfactants for use in the compositions of the present invention include sodium lauroamphoacetate, and ammonium cocoyl isethionate.

Another preferred class of amphoterics, sometimes classified as zwitterionics, are betaines. Examples of betaines useful herein include the high alkyl betaines, such as cocoamidopropyl betaine. Mixtures of any of the amphoteric surfactants can be used in the composition of the present invention.

The amphoteric surfactant of the surfactant system is present in the compositions of the present invention at concentrations of at least about 0.003%, preferably at least about 0.0075% and most preferably at least about 0.01% by weight of the composition.

Nonionic Surfactants

Also essential to the surfactant system of the present invention are nonionic surfactants. Nonionic surfactants suitable for use in the compositions of the present invention have a formula selected from the group consisting of:



and mixtures thereof where R is a long chain alkyl group or mixer of alkyl groups containing 10-24 carbon atoms; X is a phenyl, >C=O , sulfur or nil; Y is a hydrogen or methyl; and n is an integer from 1 to 20, preferably from 2 to 15, and most

5 preferably from 2 to 10; when X is nil, R is bonded directly to $-(\text{OCH}_2\overset{\text{Y}}{\underset{\text{CH}}{\text{CH}}})_n-$ and wherein R₁ contains an alkyl, alkenyl or monohydroxy alkyl radical of from about 8 to about 18 carbon atoms, from 0 to about 10 ethylene oxide moieties, and from 0 to about 1 glyceryl moiety, and R₂ and R₃ contain from about 1 to about 3 carbon atoms and from 0 to about 1 hydroxy group, e.g., methyl, ethyl, propyl,
 10 hydroxymethyl, hydroxyethyl, or hydroxypropyl radicals; where Z is a nitrogen, phosphorus or sulfur bonded directly to O (oxygen). The arrow in the formula is a conventional representation of a semipolar bond.

Nonionic surfactants suitable for use in the present compositions are
 15 described in U.S. Patent 4,472,297 (previously incorporated by reference) and are further described in "Surfactant Science Series: Nonionic Surfactants", Volume 1, edited by Martin J. Schick, Marcel Dekker, New York (1966) all of which are herein incorporated by reference in its entirety. Mixtures of any of the above described nonionic surfactants can be used in the composition of the present invention.

20 Preferred for use in the compositions of the present invention are polyoxyalkylene alcohol surfactants, especially alkyl polyethyleneglycol ethers, alkyl polypropyleneglycol ethers, alkyl polyethylene glycol esters, and alkyl polypropylene glycol esters and mixtures thereof. Nonlimiting examples of suitable nonionic surfactants for use herein include Laureth-4, Cetareth-10, Lauramine
 25 oxide, Dihydroxyethyl lauramine oxide and mixtures thereof. The nonionic surfactant of the surfactant system is present in the compositions of the present invention at concentrations of at least about 0.003%, preferably at least about 0.0075% and most preferably at least about 0.01% by weight of the composition.

30 Preferably the compositions of the present invention contain less than about 1%, more preferably less than about 0.1%, and most preferably less than 0.01% of a cationic surfactant.

Water

The personal care compositions of the present invention preferably comprise from about 50% to about 99%, preferably from about 75% to about 98%, more
 35 preferably from about 85% to about 98%, by weight of water.

Optional Components

Lipophilic Materials

Also useful to the compositions of the present invention are lipophilic materials. The phrase "lipophilic material" is defined as a material having a
 40 solubility of less than 0.5% in water, preferably less than about 0.3% and most preferably less than about 0.1%.

5 Oils useful in the present invention are both natural and synthetically produced oils comprising saturated and unsaturated fatty acids. Saturated fatty acids found in the hydrocarbon oils of the present invention are selected from the group consisting of adipic, caprylic, captic, lauric, myristic, palmitic, stearic, and mixtures thereof. Unsaturated fatty acids found in the oils of the present invention are
10 selected from the group consisting of linoleic, linolenic, ricinoleic, oleic, elaidic, erucic, and mixtures thereof. The oils used herein typically are mixtures of the above fatty acids. Oils derived from natural sources such as plants contain mixtures of the above mentioned fatty acids and mono-, di- and triglycerides. These oils include castor bean oil, or castor oil, rapeseed oil, corn oil, canola oil, peanut oil,
15 avocado oil, soybean oil, palm kernel oil, babassu kernel oil, coconut oil, and mixtures thereof. A more detailed discussion as well as further examples of suitable of fatty acid derivative oils and hydrocarbon oils is found in U.S. Patent 5,593,662 (Deckner et. al.), herein incorporated by reference in its entirety.

Examples of preferred lipophilic materials include, but are not limited to,
20 perfume oils, preservatives, oil soluble vitamins, oil soluble pro-vitamins, and essential oils and mixtures thereof, most preferably preservatives and perfumes and mixtures thereof.

Non-limiting examples of preservatives useful in the present invention are benzyl alcohol, and parabens such as methyl paraben, propyl paraben, butyl paraben,
25 and LiquaPar oil (mixture of isobutyl paraben, isopropyl paraben, and butyl paraben).

As used herein, the term "perfume oil" means any odoriferous material or any material which acts as a malodor counteractant. In general, such perfume oils are characterized by a vapor pressure greater than atmospheric pressure at ambient
30 temperatures. The perfume suitable for use in the present invention will be liquid oils at ambient temperatures. A wide variety of chemicals are known for perfumery uses, including materials such as aldehydes, ketones, esters and the like. More commonly, naturally occurring plant and animal oils and exudates comprising complex mixtures of various chemical components are known for use as perfumes,
35 and such materials can be used herein. Perfumes suitable for use in the compositions of the present invention are described in U.S. Patent 5,676,584 (Angell et. al.) and further disclosed in S. Arctander, Perfume Flavors and Chemicals, Vols. I and II, Author, Montclair, N.J., and the Merck Index, 12th Edition, Merck & Co., Inc. Rahway, N.J., all of which are herein incorporated by reference in their entirety.

5 Non limiting examples of oil-soluble vitamins such vitamins A, vitamins D, vitamins E, vitamins K, and ubiquinones are found in U.S. Patent 5,489,303 (Saski et. al.), herein incorporated by reference in its entirety.

 The lipophilic materials of the present invention also include essential oils. Examples of suitable essential oils are found in U.S. Patent 5,665,689 (Durbut),
10 herein incorporated by reference in its entirety.

 Mixtures of the above lipophilic materials may also be used. The lipophilic materials of the present invention are preferably present at concentration levels of from about 0.05% to about 0.5%, preferably from about 0.05% to about 0.3%, most preferably from about 0.05% to about 0.2%.

15 Without being limited by theory, it is believed that the compositions of the present invention provide for the even, uniform and stable distribution of the lipophilic materials when used herein. The term "stable," as used herein, means that when incorporated into the compositions of the present invention, the lipophilic materials are uniformly and homogeneously distributed or dispersed throughout the
20 compositions of the present invention without flocculating and phase separating when stored at 45°C for at least a week, preferably 1 month and most preferably 3 months.

5 Additional Friction Enhancing Agent

 The personal care compositions of the present invention are preferably contain relatively small amounts of conventional friction enhancing agents. The term "Friction enhancing agents," as used herein means agents which tend to raise the hair friction significantly versus water treated hair, as measured by the KES-SE Friction Test Method described below. Examples of such friction enhancing agents, other than the water soluble, non-polymeric minerals described above, include, but are not limited to natural and synthetic polymers and resins such as polyvinylpyrrolidone/vinyl acetate, polyquaternium-11, polyquaternium-4, butyl ester of polyvinylmethacrylate/methacrylate copolymer; inorganic clays such as bentonite, ceramic, kaolin, slip clays, polyorganosilicates, kaolinite, montmorillonite, atapulgite, illite, bentonite, halloysite, silica, alumina, muds; water insoluble minerals such as magnesium carbonate, calcium carbonate, calcium oxalate, polyphosphates; sawdust; plant polysaccharides; and crustacean shells. Preferably, the additional friction enhancing agents are present at concentration levels of less than about 2%, more preferably about 1.5% by weight of the composition.

20 Hair Friction Index Measurement Test

 The personal care compositions of the present invention preferably have a hair friction index of at least about 1.07, preferably 1.10, most preferably 1.15, as measured by the KES-SE Friction Test.

 The KES-SE Friction Test Method evaluates the friction force of the surface of a flat hair switch. This is achieved with the use of a Friction instrument, KES-SE Model (by Kato Tech Ltd., Kyoto, Japan). Specific instructions for calibration, instrument operation and instrument care are provided by the manufacturer and are generally known to those of ordinary skill in the art. The hair friction index is determined as follows.

 A round glass frit 25 mm in diameter, with a porosity = C is attached to the sensor probe. The probe with the frit is weighed to the nearest 0.01 grams. The weight of the probe with glass frit should be approximately 22 grams. A control group is prepared comprised of four hair switches made up of 8 grams of hair. Each hair switch is then water treated. Water treatment of the control group switches comprises pre-wetting, shampooing and rinsing each hair switch using running water flowing at a flow rate of 1.5 cubic feet per min. Warm water ($\approx 40^{\circ}\text{C}$) is used throughout the treatment process. The hair switches are blotted with a water-absorbing, nonwoven paper material. Approximately 0.1 grams of water per gram of hair switch is then applied uniformly to each hair switch and massaged throughout

5 the hair. The hair switches are dried using a hot air ($\cong 55^{\circ}\text{C}$) blower and combed to remove tangles for approximately 4 minutes. After the treated switches are dried, the switches are equilibrated to a constant moisture content in a constant temperature environment of 21°C and having a constant humidity of 40%RH for no less than 2 hours and no longer than 4 hours. The probe is pulled longitudinally along the
10 length of each water treated hair switch from the root end of the hair switch to the tip end of the switch. The probe (and frit) should be cleaned and dried before each measurement using an alcoholic or other non-residue forming solvent and zero calibrated to test the integrity of the system. Voltage readouts from the potentiometer of the KES-SE instrument are recorded at pre-set intervals (by the
15 manufacturer) for each of the hair switches. The voltage readings are then converted to friction values using Equation 1.1:

$$\text{Friction} = [\text{voltage} \times 5]/[\text{weight of probe (g)}] \quad \text{Equation}$$

1.1

20

The friction value is determined for each of the hair switches of the control group.

Next, friction data is collected for the test group. The test group is comprised of four hair switches made up of 8 grams of hair treated with the test product. Each of the test group hair switches are pre-wetted, shampooed and rinsed as described
25 above.. Approximately 0.1 grams of the test product per gram of hair switch is then applied uniformly to each hair switch and massaged throughout the hair. The hair switches are dried using a hot air ($\cong 55^{\circ}\text{C}$) blower and combed to remove tangles for approximately 4 minutes and then equilibrated to a constant moisture content in a constant temperature environment of 21°C and having a constant humidity of
30 40%RH for no less than 2 hours and no longer than 4 hours. The friction values for each of the test group switches are then determined using the friction measurement procedure described above and Equation 1.1.

The Friction Index is determined by comparing the average friction reading of the 4 switches in the control group with the average reading of 4 switches of the
35 test group using Equation 1.2.

$$\text{Friction Index} = \text{Friction}_{\text{ave}}(\text{test group})/\text{Friction}_{\text{ave}}(\text{control group}) \quad \text{Equation}$$
1.2

40 Statistical significance is determined at the 90% confidence level ($p \leq 0.10$) by comparing the mean and variance of the 4 hair switches in the test group with the

5 mean and variance of the 4 hair switches in the control group using the Two-sampled T-test. A more detailed discussion of the disclosed friction test method is found in "Methods for the Measurement of the Mechanical Properties of Tissue Paper", R.S. Ampuski, Int. Paper Phys. Conf., pp. 19-30 (1991).

Thickening Agent

10 The personal care compositions of the present invention may also comprise a thickener or thickening agent. Such thickening agents typically comprise cationic, nonionic, anionic, and amphoteric polymers. The thickening agent is preferably present at a level of less than about 2%, more preferably from about 0.05% to about 1.5%, by weight of the composition.

15 Polymers suitable for use as thickening agents herein include any polymer soluble or colloidally dispersible in the aqueous phase (if water is the only solvent in the aqueous phase, the polymer should be soluble or dispersible in water; if an optional cosolvent such as ethanol is present the polymer should be soluble or dispersible in the combined solvent system). Solubility/dispersibility is determined
20 at ambient conditions of temperature and pressure (25°C at 1At). Polymers for use in the compositions of the present invention include cationic, anionic, nonionic, and amphoteric resins. Polymeric thickeners useful in the present are described in U.S. Patent 5,100,658 (Bolich, Jr. et. al.), herein incorporated by reference.

Nonlimiting examples of preferred thickening polymers include
25 Polyquaternium-10 (hydroxyethylcellulose hydroxypropyl trimethylammonium chloride ether) under the trade name Ucare Polymer LR natural and derivatized polysaccharides which include guar gum, locust bean gum, carrageenan, and xanthan gum, sodium alginate, sodium carrageenan, plant extracts of acacia, ghatti, and tragacanth, propylene glycol alginate, and carboxymethylcellulose and mixtures
30 thereof.

Propellant

Propellants when used in the present invention are selected depending on variables such as the remainder components, the package, and how the product is designed to be used (standing or invert).

35 When comprised in the foam compositions of the present invention, the propellant is preferably comprised at a level of 0-60%, more preferably 0-30% of the entire composition. When no propellant is used, the foam composition is usually provided in a package equipped with an air or gas mixing device.

Nonlimiting examples of propellants useful in the present invention are:
40 fluorohydrocarbons such as difluoroethane 152a (supplied by DuPont), dimethyl ether, and hydrocarbons such as propane, iso-butane, n-butane, and mixtures of

5 hydrocarbons such as LPG (liquefied petroleum gas) as well as air, nitrogen, argon and the like.

Pharmaceutical Actives

The compositions of the present invention, especially the topical skin care compositions, can comprise a safe and effective amount of a pharmaceutical active.

10 The phrase "safe and effective amount", as used herein, means an amount of an active high enough to significantly or positively modify the condition to be treated, but low enough to avoid serious side effects (at a reasonable benefit/risk ratio), within the scope of sound medical judgment. A safe and effective amount of the pharmaceutical active will vary with the specific active, the ability of the

15 composition to penetrate the active through the skin, the amount of composition to be applied, the particular condition being treated, the age and physical condition of the patient being treated, the severity of the condition, the duration of the treatment, the nature of concurrent therapy, and like factors.

The pharmaceutical actives which can be used in the compositions of the present invention preferably comprise from about 0.1% to about 20% by weight of the compositions, more preferably from about 0.1% to about 10%, and most preferably from about 0.1% to about 5%. Mixtures of pharmaceutical actives may also be used.

Useful pharmaceutical actives include antiacne actives, analgesic actives,

25 antipruritic actives, anesthetic actives, antimicrobial actives, sunscreen actives, sunless tanning actives, skin-bleaching actives, anti-dandruff actives, antiperspirant actives, deodorant actives and mixtures thereof.

Nonlimiting examples of pharmaceutical actives useful in the present invention can be found in U.S. Patent 5,622,694 (Torgerson et. al.), herein

30 incorporated by reference in its entirety.

Other useful actives include antiperspirant actives. Suitable for use herein are those which comprise any compound, composition or mixture thereof having antiperspirant activity. Astringent metallic salts are preferred antiperspirant materials for use herein, particularly the inorganic and organic salts of aluminum, zirconium and zinc, as well as mixtures thereof. Particularly preferred are the

35 aluminum and zirconium salts, such as aluminum halides, aluminum hydroxy halides, zirconyl oxide halides, zirconyl hydroxy halides, and mixtures thereof.

Additionally, deodorant actives in the form of bacteriostats may be incorporated into the present compositions. Suitable deodorant bacteriostats include

40 2,2'-methylenebis(3,4,6-trichlorophenol), 2,4,4'-trichloro-2'-hydroxy(diphenyl ether), zinc phenolsulfonate, 2,2'-thiobis(4,6-dichlorophenol), p-chloro-m-xyleneol,

5 dichloro-m-xyleneol and the like. Most preferred is 2,4,4'-trichloro-2'-hydroxy(diphenyl ether), which is generically known as triclosan and available from the Ciba-Geigy Corporation under the trademark, Irgasan DP-300 Registered TM. When triclosan is utilized it will be present in a range from about 0.05% to about 0.9%, preferably from about 0.1% to about 0.5% by weight of the composition.

10 Other types of bacteriostats include sodium N-lauroyl sarcosine, sodium N-palmitoyl sarcosine, lauroyl sarcosine, N-myristoyl glycine, potassium N-lauroyl sarcosine and aluminum chlorhydroxy lactate (sold by Reheis Chemical Company under trademark of Chloracel).

Other Optional Components

15 The personal care compositions of the present invention may further comprise one or more optional components known for use in shampoo, conditioning, styling and other personal cleansing compositions, provided that the optional components are physically and chemically compatible with the essential component described herein, or do not otherwise unduly impair product stability, aesthetics or

20 performance. Concentrations of such optional components typically range from about 0.001% to about 5 % by weight of the personal care compositions or more preferably from about 0.01% to about 3% by weight of the personal care compositions.

Optional components include water-soluble preservatives such as DMDM

25 Hydantoin (dimethylol dimethyl hydantoin), Dowicil 200 (1-cis-3-chloroallyl-3-5-7-triaza), Kathon CG, (mixture of methylchloro-isothiazolinone and methyl isothiazolinone), imidazolidinyl urea, sodium benzoate, phenoxyethanol, EDTA and its salts; anti static agents; cationic conditioning polymers such as polyquaternium-10; dyes; organic solvents or diluents; emollient oils (such as polyisobutylene,

30 mineral oil, petrolatum and isocetyl stearyl stearate); pearlescent aids; foam boosters; pediculocides; pH adjusting agents; proteins; antioxidants; chelators and sequestrants; colorings; skin sensates; astringents; skin soothing agents; skin healing agents and the like; non limiting examples of these components include panthenol and derivatives (e.g. ethyl panthenol), pantothenic acid and its derivatives,

35 phytantriol; menthyl lactate, witch hazel distillate, allantoin, bisababol, dipotassium glycyrrhizinate and the like; suspending agents; other plant and botanical extracts; water-soluble vitamins; and viscosity adjusting agents. This list of optional components is not meant to be exclusive, and other optional components can be used.

40 The personal care compositions of the present invention have also been found to be useful as a means of providing the appearance of clean hair and scalp.

5 Sebum and oils produced by the scalp can make the hair appear soiled, clumped and oily. Without being limited by theory, the personal care compositions of the present invention provide sufficient amounts of surfactant and minerals to aid in redistributing the sebum oils and other soiling materials, providing the visual perception of cleaner looking hair with improved scalp moisturization.

10 Although the compositions of the present invention are primarily contemplated for use as personal care compositions such as shaving creams, mousses, depilatories and the like. Those skilled in the art will quickly recognize that the compositions of the present invention will also find use in such areas as hard surface cleaners (e.g., bathroom and floor cleaners) or any other area for which foam
15 compositions may be useful.

Method of Manufacture

The personal care foam compositions of the present invention, in general, can be made by simply mixing together all components using low shear mixing methods. In compositions which use thickening agents, it is advantageous to first solubilize the
20 thickening agents in water before the addition of the other components and the water soluble salts of the compositions.

Method of Use

The personal care foam compositions of the present invention are used in a
25 conventional manner for applying personal care products to the hair or skin. An effective amount of the composition for treating the hair or skin is applied to the hair or skin, that has preferably been wetted with water, and then leaving the composition on the hair or skin to dry or aiding in the drying process with hot air blow drier devices or heated implements. Such effective amounts generally range
30 from about 0.5 g to about 50g, preferably from about 1 g to about 20g. Application to the hair or skin typically includes contacting the hair or skin with the composition and working the composition throughout the hair or onto the skin or specifically where the effect is most desired.

This method for treating the hair or skin comprises the steps of:

35 a) wetting the hair or skin with water, b) applying an effective amount of the personal care composition to the hair or skin, and c) allowing the composition to dry on hair or skin as the hair or skin dries or is dried with a hot air appliance.

In view of its hydrophilic nature, the personal care compositions of the present invention are easily and readily removed with water.

40

Examples

5 The personal care foam compositions illustrated in Examples 1-4 illustrate specific embodiments of the personal care compositions of the present invention, but are not intended to be limiting thereof. Other modifications can be undertaken by the skilled artisan without departing from the spirit and scope of this invention. These exemplified embodiments of the personal care compositions of the present invention provide improved personal care and conditioning.

10 All exemplified compositions can be prepared by conventional formulation and mixing techniques. Component amounts are listed as weight percents and exclude minor materials such as diluents, filler, and so forth. The listed formulations, therefore, comprise the listed components and any minor materials associated with such components.

15 Examples 1-4 are foam compositions produced upon dispensing or spraying the compositions of the present invention. The compositions are formed by combining and mixing the ingredients of each column using conventional technology. About 0.5 g to about 50g of the personal care foam composition is applied to the hair and/or skin.

EXAMPLE 1

FOAM COMPOSITION	% w/w
Polyquaternium-10 (U-Care Polymer LR-400, Amerchol, Edison, NJ)	0.25
Sodium Sulfate	1.0
Tetrasodium EDTA	0.13
DMDM Hydantoin (Glydant, Lonza Inc., Fairlawn, NJ)	0.20
Cocamidopropyl betaine (Tegobetaine F-B, Goldschmidt, Hopewell, VA)	0.015
Laureth-4 (Brij 30, ICI Surfactants, Wilmington, DE)	0.004
Sodium Lauroyl Sarcosinate (Hamposyl L-30, Hampshire Chem. Corp., Lexington, MA)	0.07
Perfume	0.05
Citric Acid	0.1
Water	q.s. to 100%

EXAMPLE 2

FOAM COMPOSITION	% w/w
Polyquaternium-10 (U-Care Polymer LR-400, Amerchol, Edison, NJ)	0.25
Sodium Sulfate	1.0
Tetrasodium EDTA	0.13
Quaternium-15 (Dowicil 200, Dow Chemical, Midland, MI)	0.135
Cocamidopropyl betaine (Tegobetaine F-B, Goldschmidt, Hopewell, VA)	0.015
Laureth-4 (Brij 30, ICI Surfactants, Wilmington, DE)	0.004
Sodium Lauroyl Sarcosinate (Hamposyl L-30, Hampshire Chem. Corp., Lexington, MA)	0.07
	0.05
	0.1
	q.s. to 100%
Perfume	
Citric Acid	
Water	

EXAMPLE 3

FOAM COMPOSITION	% w/w
Polyquaternium-10 (U-Care Polymer LR-400, Amerchol, Edison, NJ)	0.25
Sodium Chloride	1.5
Tetrasodium EDTA	0.13
Quaternium-15 (Dowicil 200, Dow Chemical, Midland, MI)	0.135
Cocamidopropyl betaine (Tegobetaine F-B, Goldschmidt, Hopewell, VA)	0.015
Laureth-4 (Brij 30, ICI Surfactants, Wilmington, DE)	0.004
Sodium Lauroyl Sarcosinate (Hamposyl L-30, Hampshire Chem. Corp., Lexington, MA)	0.07
	0.05
	0.1
	q.s. to 100%
Perfume	
Citric Acid	
Water	

EXAMPLE 4

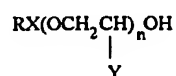
FOAM COMPOSITION	% w/w
------------------	-------

Polyquaternium-10 (U-Care Polymer LR-400, Amerchol, Edison, NJ)	0.25 1.5
Sodium Chloride	0.13
Tetrasodium EDTA	0.20
DMDM Hydantoin (Glydant, Lonza Inc., Fairlawn, NJ)	0.015
Cocamidopropyl betaine (Tegobetaine F-B, Goldschmidt, Hopewell, VA)	0.004 0.15
Laureth-4 (Brij 30, ICI Surfactants, Wilmington, DE)	
Ammonium cocoyl isethionate (Jordapon ACI-30, PPG Specialty Chemicals, Gurnee, IL)	0.05 0.1 q.s. to 100%
Perfume	
Citric Acid	
Water	

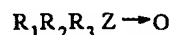
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WHAT IS CLAIMED IS:

1. A personal care composition dispensable as a stable foam, comprising:
- a.) from 0.5% to 5% by weight of the composition of a friction enhancing agent which is a water soluble, non-polymeric mineral salt;
 - b.) from 0.01 to 0.5% of a surfactant system comprising:
 - i.) at least 0.003% of at least one anionic surfactant;
 - ii.) at least 0.003% of at least one amphoteric surfactant;
 - and
 - iii.) at least 0.003% of at least one nonionic surfactant having a formula selected from the group consisting of:



20



and mixtures thereof where R is a long chain alkyl group or mixer of alkyl groups containing 10-24 carbon atoms; X is a phenyl, >C=O , S or nil; Y is a hydrogen or methyl; and n is an integer from 2 to 6; when X is nil, R is bonded directly to $\text{-(OCH}_2\text{CH)}_n\text{-}$ and wherein R_1 contains an alkyl, alkenyl or monohydroxy alkyl radical of from 8 to 18 carbon atoms, from 0 to 10 ethylene oxide moieties, and from 0 to 1 glyceryl moiety, and R_2 and R_3 contain from 1 to 3 carbon atoms and from 0 to 1 hydroxy group; and Z is a nitrogen, phosphorus or sulfur bonded directly to O;

25

30

and

c.) water

35

wherein the composition contains less than about 0.2% by weight of the composition of a protein modifying agent and wherein the composition contains less than 0.01% formate, sorbate, salicylate and carbonate.

2. A composition according to Claim 1, further comprising a lipophilic material.

40

3. A composition according to Claim 2, wherein the lipophilic material is uniformly and stably dispersed in the composition.
- 45 4. A composition according to Claim 1, wherein the lipophilic material is selected from the group consisting of perfume oils, preservatives, oil-soluble vitamins, oil-soluble pro-vitamins, essential oils and mixtures thereof.
- 50 5. A composition according to Claim 4, wherein the preservative is selected from the group consisting of benzyl alcohol, methyl paraben, propyl paraben, butyl paraben, isobutyl paraben, isopropyl paraben, and mixtures thereof.
- 55 6. A composition according to Claim 5, further comprising a water-soluble preservative selected from the group consisting of DMDM Hydantoin, 1-cis-3-chloroallyl-3-5-7-triaza, methylchloro-isothiazolinone, methyl isothiazolinone, imidazolidinyl urea, sodium benzoate, fatty alcohol quats, phenoxyethanol, EDTA and its salts, and mixtures thereof.
- 60 7. A composition according to Claim 4, wherein the perfume oil selected from the group consisting of galaxolide, para-tertiary bucinal, benzyl acetate, hexyl cinnamic aldehyde, phenyl ethyl alcohol, citronellol, geraniol, and dihydro iso jasmonate.
- 65 8. A composition according to Claim 1, wherein the anionic surfactant is selected from the group consisting of sulfates, sulphonates, taurines, sarcosinates, and isethionates and mixtures thereof.
- 70 9. A composition according to Claim 8, wherein the anionic surfactant is selected from the group consisting of sarcosinates, isethionates and mixtures thereof.
10. A composition according to Claim 1, wherein the amphoteric surfactant is selected from the group consisting of alkylbetaines, alkylamphoacetates and alkyaminopropionates and mixtures thereof.
- 75 11. A composition according to Claim 10, wherein the amphoteric surfactant is alkylbetaines, alkylamphoacetates and mixtures thereof.

12. A composition according to Claim 1, wherein the nonionic surfactant is selected from the group consisting of alkyl polyethyleneglycol ethers, alkyl polypropyleneglycol ethers, alkyl polyethylene glycol esters, and alkyl polypropylene glycol esters and mixtures thereof.
13. A composition according to Claim 12, wherein the alkyl polyethyleneglycol ether is Laureth-4.
14. A composition according to Claim 1, wherein the water soluble, non-polymeric mineral salt is selected from the group consisting of sodium, potassium, calcium and magnesium salts of sulfate, chloride, gluconate, lactate, acetate, citrate and mixtures thereof.
15. A composition according to Claim 1, wherein the concentration of the water soluble, non-polymeric mineral salt is from about 0.7% to about 4%, by weight of the total composition.
16. A composition according to Claim 1, further comprising a pharmaceutical active.
17. A composition according to Claim 16, wherein the pharmaceutical active is selected from the group consisting of antiacne actives, analgesic actives, antipruritic actives, anesthetic actives, antimicrobial actives, sunscreen actives, sunless tanning actives, skin-bleaching actives, anti-dandruff actives, antiperspirant actives, deodorant actives and mixtures thereof.
18. A method of treating hair by administering a safe and effective amount of the compositions according to Claim 1.
19. A method of providing the visual perception of clean hair by administering a safe and effective amount of the compositions according to Claim 1.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/IB 98/01465

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 A61K7/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 95 13788 A (PROCTER & GAMBLE) 26 May 1995 see the whole document ----	1-19
A	WO 93 09761 A (RICHARDSON-VICKS) 27 May 1993 see the whole document ----	1-19
A	WO 95 01152 A (PROCTER & GAMBLE) 12 January 1995 see the whole document -----	1-19

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search

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Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Fischer, J.P.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/IB 98/01465

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